



FOREST PEST MANAGEMENT

Pacific Southwest Region

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PINE NEEDLE-SHEATH MINER IN A PONDEROSA PINE PLANTATION ON THE OAK KNOLL RANGER DISTRICT, KLAMATH NATIONAL FOREST

PSW FOREST PEST RANGE
EXPERIMENT STATION

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ABSTRACT

A 13-year-old plantation of ponderosa pine suffered severe defoliation of current needle production in 1981. The damage was caused by the pine needle-sheath miner. Loss of the current year foliage had no apparent effect on the pines, but the plantation will be monitored in 1982 for the more serious possibility of two consecutive years of needle loss.

INTRODUCTION

On August 25, 1981, John Dale and Jim Allison, pathologist in Forest Pest Management, were accompanied by Bruce Goines and Doug Claypool from the Oak Knoll District for an evaluation of the defoliation on ponderosa pine in Jakes Gulch and Rider Gulch.

OBSERVATIONS

The plantation examined is located within an area burned in the Haystack Fire of 1956. The initial attempt at reforestation failed and the 110 acres were terraced in 1967 and replanted in 1968. The planting stock is of unknown seed source other than the origin of Zone X under the old classification system. This zone stretched some 175 miles from the Stonyford

District, Mendocino National Forest, to the Oregon-California border. Consequently, the pine presently in the plantation may not represent planting stock best suited to the site. Nonetheless, many of the pine have done rather well considering the possible origin of the stock and the quality of the site, and a thinning is scheduled for 1983.

District personnel had previously cruised two strips within the plantation and found that 85% of the trees had 80% of their current needle growth defoliated either lightly, moderately, or severely. Most of the defoliation appeared to be in the severe category. However, there were trees scattered throughout the plantation that remained free of any defoliation.

Examination of the damage, silken webbing and pupal cases indicated that the insect causing the defoliation is the pine needle-sheath miner, Zelleria hambachi Busch. A very minor amount of dead branch tips also was noted, the cause of which is the ponderosa pine tip moth, Rhyacionia zozana (Kearfott).

THE PINE NEEDLE-SHEATH MINER

This small ermine moth has frequently caused defoliation in ponderosa pine plantations in northern California and southern Oregon. These plantations usually occur on poorer sites and suffer from vegetative competition - a description that adequately suits the situation in Jakes Gulch and Rider Gulch. Outright tree killing has not been observed, even with nearly total defoliation. Growth reduction from severe infestations has not been verified or quantified.

Evidence of infestations is the fading of newly developing needles and cessation of needle growth. Those needles already elongated when damaged tend to droop back sharply at the sheath. These longer needles are cut off in the needle sheath by the feeding larvae and eventually are blown away by the wind. Light damage may be hardly noticeable, but heavy damage will leave only "candles" bearing a few to no needles on the branch tips.

Adults are very small moths, light in color, and are not usually observed by personnel conducting forest management activities. Adults appear from about mid-June to mid-August and eggs are laid during this period. The current year's foliage is the preferred site.

Hatching larvae bore directly into the needles and become true needle miners. They may be found within the 2 angles made by the curved outer needle surface and the 2 inner straight surfaces. The mines constructed within an angle by the larvae eventually turn yellow and can be detected as thin lines along the needle edge. It is within these mines that the larvae pass the winter.

In the spring the previously sluggish larvae become very active. They molt to a second instar, widen and extend their mines to the center of infested needles, and then abandon the needles. The larvae now move to the new growth and begin feeding within the sheaths of the tender young needles. They are no longer needleminers at this stage. Eventually the

larvae are too large to feed entirely within the sheaths and an increasingly dense silken webbing is spun over and between sheaths as a shelter. After 3 to 4 weeks of this feeding within sheaths, the larvae have destroyed 6 to 10 fascicles of needles. A small hole is left in the sheath surrounding each damaged fascicle. Pupation occurs within the silken webbing and in about 10 days adults begin to emerge.

The insect has a number of parasites and possibly a number of predators. Weather also is assumed to be a particularly important factor. The winter of 1980-81 was very mild. The proportion of overwintering survivors may have been higher than normal, and may have contributed substantially to the damage level observed in the plantation.

DISCUSSION

The pine needle-sheath miner is not an insect that should seriously affect management of the plantation. Populations of the insect wax and wane and a normal winter may return the presently damaging population to endemic levels.

Management Alternatives

1. Proceed with scheduled entry. The plantation is scheduled for thinning in 1983, and the presence of the pine needlesheath miner should not alter this schedule. The influence of stocking levels on the pine needle-sheath miner has not been experimentally examined, but it appears that stocking has no influence on the incidence and severity of defoliation. Reduction in stocking by thinning would increase the vigor of leave trees and thereby reduce the effect of the defoliation.

The creation of slash during the thinning should be carefully handled to prevent the buildup of pine engravers, *Ips* spp. This is particularly true if high levels of defoliation persist in 1983 and vigor has been impacted. Guidelines for slash management to prevent damage caused by pine engravers are given in Appendix.

2. Spray the trees with an appropriate insecticide¹. The presence of the pine needle-sheath miner has only rarely justified the use of insecticides in field situations. This approach has been economically reasonable with heavy defoliation in arboreta, ornamental plantings and Christmas tree plantations. Until the probability of unacceptable damage is high in this plantation, economic and environmental considerations probably will rule out chemical suppression as a feasible alternative.

¹ Insecticides vary in active ingredient, formulation, method of application, efficacy, effects on non-target organisms, and residual life. Should the District ever contemplate the possibility of using an insecticide, Forest Pest Management should be consulted for a biological evaluation and, if application is deemed necessary, assistance in selection of the appropriate material. (See FSM 3450 for details, including criteria, for possible FPM funding.)

3. Monitor the damage for possible survey of growth impact. Continued defoliation in 1982, along with the continued escape of the trees not defoliated in 1981, would provide an opportunity to survey possible impacts by the pine needle-sheath miner on growth. Those trees not defoliated in either 1981 or 1982 would likely be strong candidates for leave trees in the thinning schedule for the plantation in 1983 and there would be ample defoliated trees remaining for the purposes of the survey. Final decision on such a survey and its design will be made after evaluating the defoliation intensity in 1982 and consultation between District and FPM personnel.

Alternative 1 appears to be a reasonable approach, given the limited knowledge available on the influence of defoliation by this insect on growth performance and host vigor. Forest Pest Management personnel will conduct an evaluation of any further defoliation in July, 1982, for the consideration and possible implementation of Alternative 3.

b. Chipping is very effective and especially useful in degraded areas.

c. Slash can be burned, but any heat around or surrounding trees will make them more liable to insect attack.

d. Logging and gathering the slash is more difficult, and particularly heavy from the base of leave trees, will cause the slash to dry sufficiently to prevent completion of the insect life cycle.

e. When pine sawmill operations become active in slash to contain a forest, the location nearby of a fresh supply of slash during the first period of the sawmill shifts will generally attract the beetles. The slash should be created just as the majority of the population enters the pupal stage. Once this "green chain" is initiated, the technique should be continued for some conversion of the season until autumn. The "chain" can then be broken by the slash treatments previously mentioned.

APPENDIX

Minimizing Pine Mortality caused by Pine Engravers

Thinning should occur from mid-July to December, with the optimum time of slash creation being August, September and October. Slash created from December through the remainder of winter will maintain a "fresh" quality suitable for a rapid increase in the beetle population that survives the winter. Creation of slash in the spring and into July further enhances the probability of undesirable population increases. However, it is not always possible to avoid creating slash in the high risk months of December through June. When this occurs, several management practices can be used to help minimize the potential impact.

a. Dozer trampling of slash can be effective in reducing the volume of breeding material.

b. Chipping is very effective and especially useful in developed areas.

c. Slash can be burned, but any heat scorch to surrounding trees will make them more liable to insect attack.

d. Lopping and scattering the slash in stand openings, and particularly away from the base of live trees, will cause the slash to dry sufficiently to prevent completion of the insect life cycle.

e. When pine engraver populations increase enough in slash to constitute a threat, the creation nearby of a fresh supply of slash during the flight period of the emerging adults will generally attract the beetles. The slash should be created just as the majority of the population enters the pupal stage. Once this "green chain" is initiated, the technique should be continued for each generation of the season until autumn. The "chain" can then be broken by the slash treatments previously mentioned.



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Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels. Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides where there is danger of drift when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment, if specified on the label.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your local forest pathologist, county agriculture agent, or State extension specialist to be sure the intended use is still registered.



Use Pesticides Safely
FOLLOW THE LABEL

U.S. DEPARTMENT OF AGRICULTURE